

# Geothermal Heat Pump Demonstration Project

**Location:** Beijing, Ningbo, and Guangzhou

**Type:** Geothermal heat pump (GHP)

**Size:** 5,825 tons cooling/heating capacity

**Funding:** Total: US\$5,460,000

Private: US\$5,300,000

Public: US\$160,000

**Objective:** To provide cost-effective heating and cooling using renewable energy.

**Duration:** 1987–2001

**Scale:** Urban

## Summary

This project, a part of the United States (US)/China Bilateral Protocol on Energy Efficiency and Renewable Energy, resulted in the completion of three major residential GHP demonstration projects. These projects, which were facilitated with training, information, study tours, and prefeasibility studies, were ultimately financed on a purely commercial basis, with a total investment of US\$5,300,000 by private-sector Chinese companies.

## In-Country Principles That Attracted Nondonor Financing

- Capacity building and informed decision making
- Public participation in, and support of, sustainable development

Key to attracting private-sector financing was the ability for the energy sector to operate under standard commercial practices. Related to this were the increased awareness,

knowledge, and skills of sector professionals in commercial business practices, which resulted from study tours, stakeholder partnerships, exchanges, and participation in international forums and workshops.

Another important principle that helped attract private-sector interest was increased public knowledge of, and participation in, energy decision making. Programs in professional training, public education and communication, and outreach helped increase public access. A particularly important activity in this area was developing and implementing monitoring and evaluation strategies and tools for measuring the impact of education, communication, and outreach programs.

## Financing

Total capital costs for equipment purchases were approximately US\$5,300,000. All of these funds came from private-sector Chinese developers.

Prior to the capital investment, the US Department of Energy (USDOE) provided training, linkages to US industry, information exchanges, and prefeasibility funds, totaling about US\$160,000 over several years.

## The Project

As China moves toward sustainable economic and energy development, a key challenge is how to reduce its reliance on coal combustion, with its associated adverse environmental impacts. China has rich geothermal resources and a long history of geothermal resource use for direct applications. More than 1,600 sites in China use geothermal energy, and these sites have produced energy equivalent to 5,000,000 tons of coal.

GHP technology, which uses soil or water temperature as a heat exchanger to heat and cool buildings, is a cost-effective, energy-efficient, and environmentally friendly way to cool and heat buildings in China.

China and the USDOE have identified eight pilot GHP projects. Three have been demonstrated successfully. They include separate apartment projects in Beijing, Ningbo, and Guangzhou. These projects are to be replicated on a larger scale, with the goal of commercialization.

The GHP technology saves end users energy and money. Reduced power demand reduces utilities' needs to build more plants, and offsetting the electricity consumption for cooling in buildings reduces peak power loads for utilities.



## Technical Data

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GHP technology uses the earth's relatively constant soil temperature to provide efficient year-round heating and cooling, by exchanging heat with the earth through a system of buried plastic pipes, or ground heat exchangers.

The three demonstration projects provide a combined heating and cooling capacity of 5,525 tons.

## Performance Data

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Performance monitoring is underway, and preliminary results indicate that the GHPs are resulting in reduced operating and maintenance costs. Monitoring and evaluation of the project and dissemination of this information will help to further develop the market for GHP technology.

## Participants and Roles

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Chinese developers implemented the demonstration projects, the USDOE provided training and outreach, and the USDOE's National Renewable Energy Laboratory (NREL) provided technical assistance.

## Partner Contacts

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